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10/575,092	04/07/2006	Takashi Arakane	288835US0PCT	8650

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
WILLIAMS, AARON	

ART UNIT	PAPER NUMBER
2889	

NOTIFICATION DATE	DELIVERY MODE
05/14/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/575,092	ARAKANE ET AL.	
	Examiner	Art Unit	
	Aaron Williams	2889	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/7/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Receipt is acknowledged of applicant's amendment filed 1/21/2009. Claims 1-20 are pending and an action on the merits is as follows.

Specification

1. The title of the invention is still not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Objections

The objections in the office action of September 19, 2008 to claims 10 and 19 for informalities have hereby been withdrawn due to amendment filed 1/21/2008.

Claim Rejections - 35 USC § 112

The rejections under 35 U.S.C. 112, second paragraph, in the office action of September 19, 2008 to claims 10 and 19 have hereby been withdrawn due to amendment filed 1/21/2008.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 5 - 9, 11 – 13 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent Grant Publication 2004/0032214 by Lee et al., herein refer to as Lee.

Regarding claim 1 Lee discloses in figures 1 - 4D, an organic electroluminescent device comprising in sequence an anode (Figure 3, refer to paragraph [0028] where discloses an anode (31)), a first emitting layer (refer to paragraph [0030] emitting layer (44), tris(8-hydroquinolinato) aluminum (Alq3) is the material disclosed by the reference), a carrier barrier layer (refer to at least paragraph [0033] controlling layer (45), bathocuproine is the material disclosed by the reference), a second emitting layer (refer to paragraph [0030] emitting layer (50), 4,4-bis(2,2-diphenylvinyl)-1,1'-biphenyl (DPVBi) or 4-(dicyanomethylene)-2-t-butyl-6-(1,1,7,7-tetramethyljulolidyl-9-enyl)-4H-pyran (CDJTB) doped Alq3 is the material disclosed by the reference) and a cathode stacked (refer to paragraph [0035] cathode (48)); wherein the ionization potential of the carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting layer by 0.1 eV or more. The Examiner notes that materials disclosed by the applicant in the specification that have the claimed ionization potentials and affinity levels are anticipated (based on inherency) by the Lee reference thus the claim limitations have been met.

Regarding claim 2 Lee discloses in figures 1 - 4D, the organic electroluminescent device according to claim 1, wherein the ionization potential of the carrier barrier layer (carrier controlling layer (45)) is more than the ionization potential of the first emitting layer (emitting layer (44)) by 0.2 eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting

layer by 0.2 eV or more. The Examiner notes that materials disclosed by the applicant in the specification that have the claimed ionization potentials and affinity levels are anticipated (based on inherency) by the Lee reference thus the claim limitations have been met.

Regarding claim 5 Lee discloses in figures 1 – 4D, the organic electroluminescent device according to claim 1, wherein the first emitting layer (light emitting layer (44)) comprises a first dopant for a first emission color and the second emitting layer (light emitting layer (49)) comprises a second dopant for a second emission color. Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating.

Regarding claim 6 Lee discloses 1 – 4D, the organic electroluminescent device according to claim 5, wherein at least one carrier barrier layer comprises a third dopant for a third emission color. The Examiner notes that the one of the layer, such as a layer of (Alq_3), can have carrier barrier traits which when doped can becoming an emitter layer. This case with Lee's 49 which can be a green emitting layer which is composed of (Alq_3).

Regarding claim 7 Lee discloses 1 - 4D, the organic electroluminescent device according to claim 6, wherein the first, second and third dopants are selected from blue, green or red. Refer to paragraph [0030] for the details of the dopant colors.

Regarding claim 8 Lee discloses in figures 1 – 4D, the organic electroluminescent device according to claim 1, wherein the first emitting layer emits

blue or red light. Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating order.

Regarding claim 9 Lee discloses in figures 1 – 4D, the organic electroluminescent device according to claim 1, wherein the second emitting layer emits blue or red light. Refer to paragraph [0030] for the details of the dopant colors. Further in paragraph [0030] Lee states that his Light-emitting layers have no particular limitation on laminating order.

Regarding claim 11 Lee discloses in figures 1 – 4D, the organic electroluminescent device according to claim 1, wherein the first emitting layer comprises a hole-transporting material and the second emitting layer comprises an electron-transporting material. The Examiner notes that materials disclosed by the applicant in the specification that have the claimed electron mobility and hole mobility are anticipated by the Lee reference thus the claim limitations have been met.

Regarding claim 12 Lee discloses in figures 1 – 4D, the organic electroluminescent device according to claim 11, wherein the hole mobility of the first emitting layer is 10^{-5} cm^2/vs or more and the electron mobility of the second emitting layer is 10^{-6} cm^2/vs or more. The Examiner notes that materials disclosed by the applicant in the specification that have the claimed electron mobility and hole mobility are anticipated by the Lee reference thus the claim limitations have been met.

Regarding claim 13 Lee discloses in figures 1 – 4D, the organic electroluminescent device of claim 1 that emits white light. Refer to paragraph [0035]

where Lee describes his device as a white light-emitting organic electroluminescent element.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 3, 4, 14 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Publication 2002-313553 to Omori et al., herein refer to as Omori., and further in view of US Patent 7,022,421 to Thompson et al., herein refer to as Thompson.

Regarding claim 3 Omori discloses in figure 2, an organic electroluminescent device comprising in sequence an anode (refer to paragraph [0024] where discloses a transparent anode (1)), a first emitting layer (refer to paragraph [0024] 1st luminous layer (4a)), a first carrier barrier layer (refer to paragraph [0024] 1st hole barrier layer (5a)), a second carrier barrier layer (refer to paragraph [0024] 1st electron barrier layer (3a)), a

second emitting layer (refer to paragraph [0024] emitting layer (50)) and a cathode (refer to paragraph [0024] cathode (48)) stacked;

However Omori fails to disclose wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.1 eV or more.

Thompson teaches in column 14 lines 30 – 45 the difference of the HOMO energy levels of the electron blocking layer (EBL), which is related to the ionization potential, and any adjacent layer can be 500 meV. Thompson also teaches in column 13 lines 43 – 57 the difference of the LUMO energy level of the hole blocking layer (HBL), which is related to the electron affinity level, and any adjacent layer can be 500 meV. Thompson provides motivation in column 4 lines 1 - 7 where he states the materials forming the EBL and HBL are compounds that are stable during oxidation and reduction to prevent damage to the organic layer. Thus these materials are preventing degradation to the OELD device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized EBL and HBL in Omori's organic EL device since Thompson teaches that the use of such EBL and HBL material prevents damage of the organic layer. Both the Omori and Thompson are in the same field of endeavor (light emitting devices) and are directed to the same problem sought to be solved (optimizing organic EL devices).

Regarding claim 4 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, Thompson further teaches wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.2 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.2 eV or more. Thompson teaches in column 14 lines 30 – 45 the difference of the HOMO energy levels of the electron blocking layer (EBL), which is related to the ionization potential, and any adjacent layer can be 500 meV. Thompson also teaches in column 13 lines 43 – 57 the difference of the LUMO energy level of the hole blocking layer (HBL), which is related to the electron affinity level, and any adjacent layer can be 500 meV.

Regarding claim 14 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, Thompson further teaches wherein the first emitting layer comprises a first dopant for a first emission color and the second emitting layer comprises a second dopant for a second emission color. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of two different emission layers.

Regarding claim 15 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 14, Thompson further teaches wherein at least one carrier barrier layer comprises a third dopant for a third emission color. Refer to column 12 lines 50 – 60 where it sates that the hole blocking layer can simultaneously serve as an emissive layer.

Regarding claim 16 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 15, Thompson further teaches wherein the first, second and third dopants are selected from blue, green or red. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green.

Regarding claim 17 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, Thompson further teaches wherein the first emitting layer emits blue or red light. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green. The reference clearly shows that the first layer will admit red or blue.

Regarding claim 18 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, Thompson further teaches wherein the second emitting layer emits blue or red light. In column 21 line 58-59 US Patent 5,707,745 which is incorporated by reference which teaches doping of three different emission layers for the colors red, blue, and green. It would be obvious to one of ordinary skill in the art at the time the invention was made to modify Omori's second emitting layer to emit blue or red.

Regarding claim 19 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, wherein one of the first emitting layer and the second emitting layer emits blue light, and another layer emits red light. Even though Thompson or Omori do not specifically disclose two emitting layers emit blue it is

a well known technique in the art to increase that blue emitting layers to compensate for the short lifespan of blue emitters.

Regarding claim 20 Omori discloses and Thompson teaches, the organic electroluminescent device according to claim 3, wherein the first emitting layer comprises a hole-transporting material and the second emitting layer comprises an electron-transporting material. In column 12 lines 45 - 48 US Patent 6,830,828 which is incorporated by reference which teaches doping of (Alq_3) which is an electron transporting material and doping of (α-NPD) which is a hole transporting material.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Grant Publication 2004/0032214 by Lee et al., herein refer to as Lee.

Regarding claim 10 Lee discloses in figure 1 – 4D, the organic electroluminescent device according to claim 1, wherein one of the first emitting layer and the second emitting layer emits blue light and another layer emits red light. Even though Lee does not specifically disclose two emitting layers emit blue it is a well known technique in the art to increase that blue emitting layers to compensate for the short lifespan of blue emitters. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to make two emissive layers blue to increase the life span of the device.

Response to Arguments

7. Applicant's arguments filed 1/21/2009 have been fully considered but they are not persuasive.

Applicant's arguments are as follows:

(1) Applicant argues and provides evidence that Lee fails to disclose, expressly or inherently (i.e., necessarily), the independent Claim 1 limitations that "the ionization potential of the carrier barrier layer r is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting layer by 0.1 eV or more"

(2) Applicant argues that Thompson's blocking layers prevent simultaneous emission of two emitting layers, there is no reasonable expectation that the cited prior art would have led the skilled artisan to the independent Claim 3 limitations of an "organic electroluminescent device comprising ... a first emitting layer, a first carrier barrier layer, a second carrier barrier layer, a second emitting layer ... ; wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.1 eV or more"

Examiner's responses are as follows:

(1)The examiner respectfully disagrees, Lee discloses several materials that could be used as carrier blocking material specifically bathocuproine (BCP) which has an HOMO level of -6.10 eV and a LUMO level of -2.53 eV. In light of the evidence submitted, by the attorney of recorded, BCP meets the limitation of the claim 1 and all dependent claims.

(2) The examiner respectfully disagrees, claim 3 is rejected under 35 U.S.C. 103(a). In which Omori is the Primary reference relied upon to teach that the structure of the claimed OLED is not new in the art. Thompson is the Secondary reference which is only relied upon to teach the claimed characteristic of the layers. The combination of both under 35 U.S.C. 103(a) teach that one of ordinary skill in the art, at the time the invention was made could make Omori's device in such a way that it would meet each limitation of the claim.

Conclusion

2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Williams whose telephone number is (571) 270-5279. The examiner can normally be reached on Monday thru Friday 7:00 to 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Toan Ton can be reached on (571)272-2303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Aaron Williams/
Examiner, Art Unit 2889

/Toan Ton/
Supervisory Patent Examiner
Art Unit 2889